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A REVIEW OF THE TRACHINOID FISHES AND THEIR SUPPOSED ALLIES FOUND IN THE WATERS OF JAPAN.

BY

DAVID STARR JORDAN

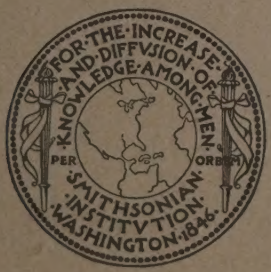
AND

JOHN OTTERBEIN SNYDER,

Of the Leland Stanford Junior University.

From the Proceedings of the United States National Museum, Vol. XXIV, pages 461-497.

[No. 1263.]



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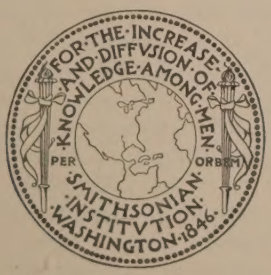

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A REVIEW OF THE TRACHINOID FISHES AND THEIR SUPPOSED ALLIES FOUND IN THE WATERS OF JAPAN.

By David Starr Jordan and John Otterbein Snyder,
Of the Leland Stanford Junior University.

In the present paper is given an account of the fishes of Japan belonging to families which have been regarded hitherto as allied to the Trachinidæ. The material examined was for the most part collected by the writers during the summer of 1900, under the auspices of the Hopkins Seaside Laboratory of Stanford University, although several specimens were obtained by the U. S. Fish Commission steamer *Albatross*. Series of types are in the museum of Stanford University and in the United States National Museum. The illustrative drawings are the work of Mr. A. H. Baldwin and Chloe Lesley Starks.

The group Trachinoidea comprises a series of transitional forms, showing affinities with the Percoidea on the one hand and with the Batrachoididæ and Blennoidea on the other. In general, the spinous dorsal is short or weak, the soft dorsal long and similar to the anal, the ventral jugular and the squamation is less complete and less ctenoid than in the Percoidea. The skull is, in general, depressed, with the supraocular crest low, and the suborbital stay is wanting, although in some genera the suborbital bones are enlarged. The bones of the skull are not strongly armed, and the ventral fins always inserted well forward, and they are sometimes reduced in size.

According to recent studies of Dr. Boulenger,[1] the Trachinidæ proper have the hypercoracoid imperforate, as in the Gadidæ. Their general relationship with the cod-fishes and blennies is such that Boulenger proposes to revive the suborder Jugulares to include not only the Gadoid fishes, but the Ophidioid, Blennioid, and Trachinoid forms also, in fact, all fishes having truly jugular ventrals. Several families hitherto called Trachinoid, but which possess thoracic ventrals, should be widely dissociated. In most cases their real place is not far from the Percoid forms. In the present paper these families are considered as well as the genuine Trachinoids.

[1] Ann. Mag. Nat. Hist., 7th ser., VIII, 1901, pp. 261–271.

ANALYSIS OF FAMILIES.

I. TRACHINOIDEA. Ventral fins jugular placed in advance of the pectorals; pectoral fin supported by the hypercoracoid and by short broad pterygials; no air bladder.

b. Hypercoracoid ("scapula") not pierced by a foramen, the foramen or fenestra lying on its lower edge adjoining the hypocoracoid, as in the *Gadidæ*.

c. Subocular lamina wanting ..... NOTOTHENIIDÆ, 1.

bb. Hypercoracoid pierced by a foramen, as usual among fishes.

d. Pterygials separate, well developed, top of head not bony. LEPTOSCOPIDÆ, 2.

dd. Pterygials much reduced, fused with the coracoids; gills $3\frac{1}{2}$, suborbitals dilated; top of head bony; physiognomy peculiar, the eyes superior, and the mouth almost vertical ..... URANOSCOPIDÆ, 3.

II. NON-TRACHINOID FORMS: Ventral fins thoracic, normally formed; pectoral fin supported on both coracoids, with well-developed pterygials; air bladder usually developed.

e. Ventrals subabdominal, although inserted well forward, the pelvis connected to the pelvic arch by a ligament; body with rough scales; lateral lines two, with cross series of pores; mouth with movable canines (allied to *Chiasmodontidæ*) ..... CHAMPSODONTIDÆ, 4.

ee. Ventrals normally thoracic.

f. Body naked; vertebræ numerous (51); pectoral broad, its lower rays thickened (allied to *Latrididæ*) ..... TRICHODONTIDÆ, 5.

ff. Body scaly.

g. Muciferous system of head largely developed; mouth small, with small teeth (allied to *Sciænidæ*) ..... SILLAGINIDÆ, 6.

gg. Muciferous system little developed; subocular lamina developed.

h. Lateral line single, complete; scales small; body compressed. LATILIDÆ, 7.

hh. Lateral line incomplete, sometimes duplicated; premaxillary without posterior canine (allied to *Serranidæ*).

i. Lateral line interrupted, beginning again lower on the tail. Maxillary not dilated; scales ctenoid .. PSEUDOCHROMIDIDÆ, 8.

ii. Lateral line with the dorsal portion only developed; maxillary dilated behind; scales cycloid ... OPISTHOGNATHIDÆ, 9.

Family I. NOTOTHENIIDÆ.

Body oblong or elongate, naked or covered with rather small, firm ctenoid scales; lateral line various, sometimes double or triple; mouth moderate or large, nearly horizontal, the teeth moderate; eyes lateral or directed somewhat upward; preopercle entire, or nearly so; opercle usually with a spine; gill membranes separated or united, sometimes joined to the isthmus; branchiostegals 6 or 7; pseudo-branchiæ present; dorsal fin long, usually continuous, its anterior part with 4 to 10 spines; anal similar to soft dorsal; caudal usually not forked; pectorals broad, but two of the short broad pterygials resting on the hypercoracoid which is not pierced by a foramen, the foramen being on its lower margin; second suborbital not produced in an internal lamina; ribs and epipleurals nearly equally developed and sessile close together at base; posterior precaudal vertebræ emitting short parapophyses (Boulenger), normally placed; ventrals jugular, placed in advance of

them, well separated, a rhombic area between them, the rays I, 5; no air bladder; pyloric cæca few; vertebræ typically 10 + 20. Small fishes of the tropical and antarctic seas, often brightly colored.

a. Gill membranes united, free from the isthmus; body scaly; lateral line single.
b. Palatines without teeth; dorsal notched, its middle spines highest..*Parapercis*, 1
bb. Palatines with teeth; last spines of dorsal highest .....*Neopercis*, 2

1. PARAPERCIS Bleeker.

Percis SCHNEIDER, Syst. Ichthyol., 1801, p. 179 (*maculatus*); (not of Scopoli; a genus of Agonidæ, 1777).
Parapercis BLEEKER, Fauna Ichth. Chine, Ned. Tydskr, Dierk., IV, 1872, p. 127 (*cylindrica*).

Body cylindrical, rather elongate; mouth moderate, slightly oblique, the jaws equal; teeth villiform, with small canines; no teeth on the palatines; dorsal divided, the middle spines highest. Lateral line single curved upward anteriorly; body with ctenoid scales, gill membranes free from the isthmus.

(*παρά*, near; *Percis*, a name transferred from this genus to another to which it was earlier applied, allied to *πέρκη*, perch.)

a. Body and tail without distinct black, white edged ocelli; a broad dark lateral band; lower parts of head with dark cross bars. D. V, 21; scales, 62 .....*pulchella*, 1
aa. Body with single large ocellus at upper base of caudal fin; lower parts of head without distinct bands. D. V, 22; scales, 58.....*ommatura*, 2
aaa. Body with three or more ocelli on the lower parts; caudal with a black central blotch. D. V, 19; scales, 62.....*hexophthalma*, 3

1. PARAPERCIS PULCHELLA (Schlegel).

TOGORO[1]-IWASHI (JACK-SARDINE).

Percis pulchella SCHLEGEL, Fauna Japonica, Poiss., 1846, p. 24, pl. x, fig. 2; Nagasaki.—RICHARDSON, Ichth. China, 1846, p. 211; Canton.—GÜNTHER, Cat. Fish., II, 1870, p. 240; Nagasaki.—STEINDACHNER und DÖDERLEIN, Fische Japans, III, 1884, p. 190; Tokyo Bay.—NYSTROM, Svensk. Vet. Akad., 1887, p. 28; Nagasaki.

Head, 4 in length; depth, $5\frac{1}{3}$; depth of caudal peduncle, $2\frac{2}{3}$ in head; eye, $4\frac{1}{2}$; snout, $2\frac{2}{3}$; interorbital space, 7; pectoral, $5\frac{1}{2}$ in length; ventral, $5\frac{1}{2}$; caudal (upper rays), $4\frac{1}{3}$; D. V–21; A, 18; scales in lateral line, 62; in transverse series, 24; between lateral line and insertion of dorsal, 5.

Body elongate, subcylindrical, the caudal peduncle somewhat compressed, dorsal contour of head rising rapidly from tip of snout to interorbital space; snout short; eyes high in head, nearer to tip of snout than to posterior edge of opercle, a distance about equal to diameter of pupil, directed obliquely upward; interorbital space narrow, flat. Mouth large, oblique, lips broad, premaxillary very protractile, the maxillary entirely concealed beneath the preorbital, extending posteriorly to a vertical through anterior edge of pupil. Teeth on the

[1] Togoro is a familiar boy's name, corresponding to Jack or Charley.

jaws in 2 series, an outer row of enlarged, simple teeth, and an inner band of minute, close-set ones; a patch of small teeth on vomer. Gill-membranes forming a fold across the isthmus. Gillrakers on first arch 3 + 8, short and flat.

Upper parts of body with finely ctenoid scales, which grow smooth in the region behind occiput at base of pectoral and on the breast and belly; sides of head with small cycloid scales; interorbital space, snout, and jaws smooth.

Dorsals continuous, the spinous dorsal inserted above base of pectoral. Rays of soft dorsal and anal with free tips; rays of upper part of caudal elongate, projecting beyond edge of fin. Pectorals rounded posteriorly, the ventrals pointed.

Color in spirits yellowish brown, upper parts of body and a median lateral band dusky, each scale in the dusky areas with a small brownish spot; head with dark bands across the occiput, cheeks, and suborbital region; chin and throat with blackish spots; dorsal, anal, and caudal with pearly spots bounded by dark color.

Color in life: Body with a broad bluish white lateral band interrupted by small reddish spots; above the band, reddish olive with blue spots; below the white band is a parallel, reddish band, rather indefinite in outline, about 1½ times as wide as the former; below this band the body is of a dark-pinkish hue, each scale with a central reddish spot; occipital part of head orange yellow with a broad, bluish transverse blotch bordered by black which shades off into purple, the latter color extending backward on the body; interorbital space yellowish lilac, the yellow strongest on band between eyes; a broad yellowish band extending from eye toward maxillary; upper part of eye reddish; cheeks brownish, becoming blackish anteriorly; sides of head and upper part of snout with narrow bands of indigo blue; throat white with brownish black markings; membrane of spinous dorsal bluish white, the spines blackish, the dark color spreading to the membrane anterior to each spine, upper part of fin narrowly bordered with white; below the border is a narrow band of brownish black which shades into orange on its lower side. Soft dorsal with yellowish olive spots, the upper parts of rays tipped with orange; membrane of upper part of caudal with alternating spots of orange and of pearly white, lower part brick red with indistinct white spots; basal part of anal yellowish orange with white spots, which are bordered with blue; outer part of fin with bright bands, the colors of which blend on the margins, the outer band white, then brownish black, red, white, and again red; pectoral with a brownish spot at lower part of base; above spot, bluish with reddish reticulations, the fin suffused with pinkish shading into brick red on the margin. Lower part of ventral suffused with red, clouded with darker shades, the upper part blackish; inner ray with a line of light brick red.

Coasts of southern Japan, abundant about Nagasaki, rare northward; a showy little fish reaching a length of about 200 millimeters; our many specimens from Wakanoura and Nagasaki.

(*Pulchellus*, pretty.)

2. PARAPERCIS OMMATURA Jordan and Snyder, new species.

Head, 4 in length; depth, 5¼; depth of caudal peduncle, 3 in head; eye, 3⅔, snout, 3⅔, interorbital space, 12; pectoral, 5⅛ in length; ventral, 5; caudal, 6; D–V, 22; A., 19; scales in lateral line, 58; in transverse series 16; between lateral line and insertion of dorsal 4.

Body elongate, almost cylindrical, more compressed on caudal peduncle, the head long and pointed. Eye large, the diameter equal to length of snout, located high up, the upper margin projecting above head; interorbital space very narrow, concave; mouth moderate, oblique, the lower jaw projecting; upper lip broad, the premaxillary protractile; maxillary entirely concealed by preorbital, reaching a vertical through anterior edge of orbit. Teeth in 2 series on the jaws,

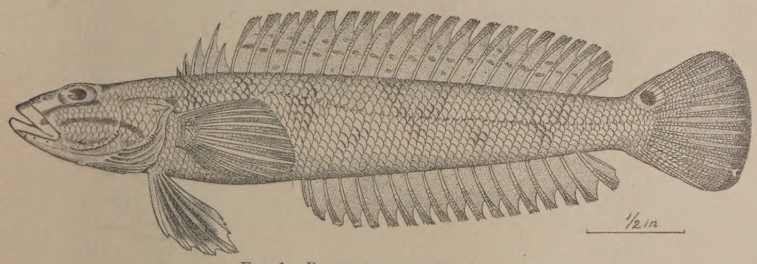

FIG. 1.—PARAPERCIS OMMATURA.

an outer row of enlarged, slightly curved, canine-like teeth, and an inner, narrow band of minute ones; a small patch of fine teeth on the vomer. Gill-membranes forming a narrow fold across the isthmus; gillrakers on first arch about 3 + 10 short, those near ends of arch represented by slight elevations. Preopercle with 6 or 7 small spines on the angular portion of the edge; opercle with a strong spine at posterior angle; about 11 small spines on the lower edge.

Body covered with ctenoid scales, the denticulations somewhat weaker on the anterior and ventral parts; occiput and sides of head with ctenoid scales; interorbital space and snout naked. Very small scales extending on basal half of caudal.

Dorsal separate or only slightly joined at their bases, the fourth spine highest and strongest, about one-third of its length longer than diameter of eye, the third spine of about equal length; rays higher than the spines, the anterior ones about equal to distance from tip of snout to posterior border of pupil. Anal inserted below the fifth dorsal ray; dorsal and anal extending an equal distance posteriorly,

neither when depressed quite reaching base of caudal; caudal rounded posteriorly; pectoral acutely rounded; ventral pointed.

Color, in alcohol, pale, brownish yellow, with a few indistinct, dusky, V-shaped marks and elongate spots on sides; two narrow longitudinal dark bands on cheeks; soft dorsal with 2 or 3 rows of elongate black spots on the membranes; anal dusky near the margin; upper basal part of caudal with a round black spot about the size of pupil, surrounded by a narrow ring of lighter color; pectoral without dark color, except a very narrow dusky margin; middle part of ventrals dark gray, becoming inky black toward end of fin, the dark color bordered by dead white.

In some specimens the markings on sides of body are more distinct, being semicircular, or more often Y-shaped. Occasionally the whole upper part of the body is dusky.

The prominent caudal spot serves at once to distinguish the species from *P. pulchella*. The latter species also reaches a much larger size.

Type.—No. 6540, Leland Stanford Junior University Museum, from Nagasaki.

A prettily colored little fish, common in the bays about Nagasaki and in the Inland Sea. Our many specimens were taken at Nagasaki, Tsuruga, and Kobe. The largest is about 120 millimeters long.

(*ὄμμα*, eye; *σῦρα*, tail.)

3. PARAPERCIS HEXOPHTHALMA (Ehrenberg).

Percis hexophthalma (Ehrenberg) CUVIER and VALENCIENNES, Hist. Nat. Poiss., III, 1829, p. 271; Massuah, Red Sea; Hist. Nat. Poiss., VII, p. 507; Seychelles.—GÜNTHER, Cat. Fish., II, 1860, p. 239; Red Sea, Louisiades.—ISHIKAWA, Prel. Cat., 1897, p. 46; Riukiu Islands.

? *Percis polyophthalma* CUVIER and VALENCIENNES, Hist. Nat. Poiss., III, 1829, p. 272; Massuah.

Percis caudimaculata RÜPPELL, Neue Wirbelthiere, Fische, 1824, p.98; Red Sea.—BLEEKER, Perc., p. 54; Celebes, IV, p. 11; Celebes.

Head 4⅓ (with caudal); depth 7; D. V.–19; A. 18; scales 7–62–19; interorbital space 3 in snout; ventrals about reaching front of anal; caudal with a black central blotch; along each side of belly three or more white rings with black centers; spinous dorsal with a black basal spot; soft dorsal with three lengthwise series of black spots; anal with one. (*Günther.*) East Indies, a specimen from the Riukiu Islands in the Imperial Museum of Japan; not seen by us.

(*ἓξ*, six; *ὀφθαλμος*, eye.)

2. NEOPERCIS Steindachner.

Parapercis STEINDACHNER, Ichth. Beitr., XIII, 1883, p. 1072 (*ramsayi*), (not of Bleeker).

Neopercis STEINDACHNER, Fische Japans, III, 1884, p. 212 (*ramsayi*).

Palatines with teeth; dorsal scarcely notched, the middle spines not

longer than the posterior ones. Dorsal rays V, 23; A. 20; scales about 60. Otherwise essentially as in *Parapercis*.

(*νέος*, new; *Percis*.)

a. Color golden or red with blackish cross bands.

b. Cross bands in 3 or 4 pairs; a black ocellus at upper base of caudal. *sexfasciata*, 4

bb. Cross bands narrower and more numerous, about 6 broad ones, each with a narrow one before and behind it; a round black blotch (not ocellus) at upper base of caudal ..... *multifasciata*, 5

aa. Color golden red with broad cross shades of orange; no black bars or spots. *aurantiaca*, 6

4. NEOPERCIS SEXFASCIATA (Schlegel).

TORA-GISU (TIGER KISUGO[1]), TORA-HAZE (TIGER-GOBY).

Percis sexfasciata SCHLEGEL, Fauna Japonica, Poiss., 1846, p. 25; Nagasaki.—GÜNTHER, Cat. Fish., II, 1870, p. 241 (copied).—NYSTROM, Svensk. Vet. Akad., 1887, p. 28; Nagasaki.—ISHIKAWA, Prel. Cat., 1897, p. 46; Katsura, Sagami, Wakanoura, Kagoshima.

Parapercis sexfasciatus STEINDACHNER and DÖDERLEIN, Fische Japans, III, 1884, p. 22; Tokyo.—JORDAN and SNYDER, Proc. U. S. Nat. Mus., 1900, p. 369; Tokyo.

Head, $3\frac{2}{3}$ in length; depth $5\frac{1}{2}$; depth of caudal peduncle $3\frac{1}{3}$ in head; eye $3\frac{1}{2}$; snout $3\frac{1}{2}$; interorbital space $14\frac{1}{2}$; pectoral $5\frac{1}{2}$ in length; ventral $5\frac{1}{2}$; caudal $5\frac{2}{3}$; D. V, 23; A. 19; scales in lateral line 60; in transverse series 24; between lateral line and insertion of dorsal 5.

Body elongate, subcylindrical, compressed on caudal peduncle; eye high in head, directed obliquely upward; interorbital space narrow, concave; snout pointed, its length equal to diameter of eye; mouth oblique, lower jaw slightly projecting, lips broad; maxillary concealed, extending posteriorly to a vertical through anterior edge of orbit; jaws with an outer row of enlarged teeth and an inner band of very small ones; vomer and palatines with small, close-set teeth; gillrakers very small, 5 + 11 on first arch; opercle with a weak spine on upper posterior edge; edges of opercle and preopercle without denticulations.

Scales of body, occiput, and sides of head, ctenoid.

Dorsal fins continuous; fifth dorsal spine longest, about equal to length of snout; length of highest rays about 2 in head. Anal inserted below base of fifth dorsal ray, similar in shape to the soft dorsal, both fins, when depressed, extending to base of caudal; pectorals rounded posteriorly; ventrals pointed, color, red in life; sides with 4 conspicuous V-shaped, dusky marks, the color extending on base of dorsal fin; a dark band extending from base of pectoral over nape, a dark spot on cheek, another on base of pectoral, an ocellated blotch on upper part of base of caudal; membranes of dorsal with dusky clouds; anal bordered with dusky; caudal with 3 or 4 dark vertical bands, which are

[1] Kisugo or Gisu is the name of several slim-headed fishes allied to *Sillago* or to *Pierothrissus*.

conspicuous on the upper edge; ventrals dusky; pectorals without dark color except at base.

Coasts of Japan, very common in sandy bays from Tokyo southward. Our many specimens from Tokyo, Awa, Misaki, Onomichi, Kobe, Wakanoura, Tsuruga, Suruga Bay, Sagami Bay, Owari Bay, and Nagasaki.

(*Sex*, six; *fasciata*, band.)

5. NEOPERCIS MULTIFASCIATA (Döderlein).

OKIGISU (OFF SHORE KISUGO); AKATORA-HAZE (RED TIGER-GOBY).

Parapercis multifasciata Döderlein, Fische Japans., III, 1884, p. 190, pl. vi, figs. 2, 2a; Bay of Tokyo.—Jordan and Snyder, Proc. U. S. Nat. Mus., 1900, p. 369; Tokyo.

Percis multifasciata Nystrom, Svensk. Vet. Ak., 1887, p. 28; Nagasaki.

Head 3¾ in length, depth 4¼; depth of caudal peduncle 2⅔ in head; eye 3½; snout 3; interorbital space 8; pectoral 4⅔ in length; ventral 4⅚; caudal 5½; D. V, 23; A. 20; scales in lateral line 60; in transverse series 25; between lateral line and insertion of dorsal 5.

In shape, this species resembles *N. sexfasciata*. Quickly recognized differences are the steeper anterior profile, the projecting lower jaw, and the deeper caudal peduncle.

The species differ widely in color. In *N. multifasciata* there are 6 broad, dusky, vertical bands on upper half of body, each band bordered before and behind by a narrow bar of dark brown, the border of the posterior band forming a large round blotch on upper half of base of caudal. Upper half of caudal and posterior part of soft dorsal with narrow, dusky, vertical bars, the other fins plain. In large specimens the central, dusky color of the vertical bands of body becomes very indistinct, the dark borders remaining prominent. Both species are red or brownish red in life.

Coast of Japan from Tokyo to Nagasaki. The specimens described were taken in Tokyo Bay. Others were dredged in Owari Bay, in Sagami Bay off Enoshima and in Suruga Bay off Enoura, by the U. S. Fish Commission steamer *Albatross*.

(*Multus*, many; *fasciatus*, banded.)

6. NEOPERCIS AURANTIACA (Döderlein).

AKA-GISU (RED KISUGO).

Parapercis aurantiaca Döderlein, Fische Japans, III, 1884, p. 191, pl. iii, figs. 2, 2a; Tokyo.

Head 4⅔ in total length; depth 6½ to 7⅓; eye 3 to 3¾ in head; D. V–23; A. 21; scales in lateral line 57 to 60.

Snout somewhat shorter than diameter of eye; lower jaw slightly projecting; maxillary extending to a vertical through anterior part of pupil. Opercle with a single, sharp spine. Dorsals continuous,

the third and fourth spines highest, the first about one-half as long as the second, rays about $1\frac{5}{6}$ in head, anal rays about $2\frac{2}{5}$ in head. Pectoral reaching to insertion of anal, its posterior edge acutely rounded. Ventral about $1\frac{2}{3}$ in head. Caudal bluntly rounded; cheeks and opercle with scales; bases of pectoral and caudal scaled.

Golden red, with 5 broad orange-yellow bands on body; head yellow and red; fins yellow; posterior part of dorsal with about 3 narrow, oblique, purple bands; caudal with 5 vertical bands (Döderlein.)

About Tokyo, in rather deep water, taken in the winter. Not seen by us.

(*Aurantiacus*, orange-colored.)

Family II. LEPTOSCOPIDÆ.

As defined by Boulenger this family differs from Nototheniidæ in having the hypercoracoid pierced by a foramen. From the Percophidæ it differs in the absence of suborbital lamina. The skeleton of *Pteropsaron*[1] has not been examined, but it is doubtless an ally of *Bembrops*. According to Boulenger the Callionymidæ are also related to the Leptoscopidæ.

a. Body with large, scarcely ctenoid scales; dorsal fins separate: gill membranes nearly separate, free from isthmus.

b. Maxillary with a fleshy flap at its tip; preopercle with two small spines at its angle; opercle with two spines ..... *Bembrops*, 3.

bb. Maxillary without flap; preopercle entire; opercle with one distinct spine. *Pteropsaron*, 4.

3. BEMBROPS Steindachner.

Bembrops Steindachner, Sitzgber. Wien, LXXIV, I, p. 211 (Ichth. Beitr., V, 1876, p. 163, (*cavdinacula*).

Hypsicometes Goode, Proc. U. S. Nat. Mus., III, 1880, p. 347 (*gobioides*).

Bathypercis[2] Alcock, Journ. Asiat. Soc. Bengal, LXII, 1893, pp. 2, 177 (*platyrhynchus*).

Head strongly depressed, the snout spatulate. Mouth long, subhorizontal. Teeth in jaws and on vomer and palatines; maxillary with a fleshy flap or barbel at tip. Eyes very large, half lateral. Opercle with two spines; angle of preopercle with two small spines, at least in Japanese species; preorbital entire; gill opening very long, with 7 branchiostegals; Pseudobranchiæ present. Ventrals jugular. Dorsal fins 2, well separated. Belly flattened, back convex. Scales rather large, finely ctenoid.

Small fishes inhabiting depths in Asia and America.

[1] The skeleton of *Pteropsaron evolans* has, since writing this, been examined by Mr. Starks and the writer. It has the hypercoracoid with the foramen on its very lower edge, but with a ring of bone around it exactly as in *Percopercis*. It should be placed with probably *Bembrops*, also in the same family with *Neopercis* and *Percopercis*.

[2] According to Dr. Alcock, *Bathypercis platorhynchus* of the Indian Ocean is identical with *Hypsicometes gobioides* of the Atlantic, and both belong to the genus *Bembrops*. *Hypsicometes gobioides* is figured as having the preopercle entire.

7. BEMBROPS CAUDIMACULA Steindachner.

Bembrops caudimacula STEINDACHNER, Ichth. Beitr., V, 1876, p. 163; Nagasaki.

Head $2\frac{3}{5}$; D. VI–14; A. 16; V. I, 5; P. 23; scales 42; breadth of head $2\frac{3}{5}$ in its length; snout $3\frac{2}{5}$; eye $4\frac{1}{2}$; lower jaw projecting; interorbital very narrow, its width 6 in eye; mouth long, $2\frac{3}{5}$ in head; maxillary with a rather long flap or filament at its tip, which is just before anterior margin of eye; tongue spoon-shaped; snout scaleless; subopercle forming a compressed spine ending in a sharp point. Spinous dorsal slender, its height a little less than 3 in head; longest soft ray $2\frac{3}{5}$ in head; base of second dorsal 3 in head, a little shorter than anal; ventrals inserted well before pectorals and a little shorter than the latter, which are not quite half head; caudal weakly convex; lateral line complete, running low.

Color yellowish brown above, paler below; scales edged with darker; sides with diffuse brownish shades along lateral line; membranes of first dorsal black; caudal clear brownish yellow spotted with brown, an oval blackish spot just behind its base in the upper half, reaching to its posterior margin (Steindachner).

Japan. Known from one specimen $5\frac{1}{3}$ inches long from Nagasaki. (*Cauda*, tail; *macula*, spot.)

4. PTEROPSARON Jordan and Snyder, new genus.

Pteropsaron JORDAN and SNYDER, new genus (*evolans*).

Body subcylindrical, depressed anteriorly, covered with large cycloid scales; lateral line continuous; head depressed, flattened anteriorly, the snout produced, broadly spatulate; mouth large, the jaws subequal; maxillary without barbel; teeth small, on jaws, the vomer and palatines smooth; eyes very large, largely vertical in range, separated by a very narrow ridge; suborbital very narrow; cheeks and opercles scaly; preopercle rounded, entire, but with mucous tubes near its edge; opercle with a partly concealed spine before its membranous tip; gill rakers obsolete; gill membranes separate, free from the isthmus. Dorsal fins separate, the first short, but sometimes greatly elevated; second similar to anal; caudal convex; ventrals I, 5, well separated, a rhombic area before them, inserted before pectorals, the inner rays longest, pectorals normal. Lateral line simple median.

This genus is allied to *Bembrops*, from which it differs in the absence of a fleshy flap on the maxillary.

(πτερόν, wing; ψαρόν, a little fish in modern Greek.)

a. Dorsal spines 6; anal rays 27, the first dorsal and anal greatly elevated ..... *evolans* 8.
aa. Dorsal spines 4; anal rays 22, the first dorsal and anal low ..... *verecundum*, 9.

8. PTEROPSARON EVOLANS Jordan and Snyder, new species.

Head $3\frac{1}{3}$ in length, depth $7\frac{1}{2}$; depth of caudal peduncle $4\frac{3}{4}$ in head; eye $3\frac{1}{3}$; snout $3\frac{1}{3}$; interorbital space about 17; pectoral 5 in length; ventral $5\frac{1}{4}$; caudal $5\frac{1}{4}$; D. VI, I, 21; A. 27; scales in lateral line 32; in transverse series 8; between lateral line and insertion of spinous dorsal 2.

Body elongate, cylindrical, the caudal peduncle compressed; head long, pointed. Eye very large, high in head, directed obliquely upward; interorbital space very narrow, flat. Snout pointed, somewhat spatulate, slightly longer than diameter of eye. Upper jaw projecting. Mouth large, the cleft oblique, premaxillary protractile,

FIG. 2.—PTEROPSARON EVOLANS.

maxillary extending posteriorly to center of pupil. Teeth slender, sharp, in narrow bands on both jaws; no canines; no vomerine or palatine teeth. Gill-rakers on first arch 0 + 9, short, blunt, with minute setæ. Opercle with a weak, flat, concealed spine, preopercle entire.

Body covered with large, smooth scales; occiput with scales, opercle with 4 or 5 large, very thin scales, head otherwise naked. Lateral line straight.

Dorsals widely separated, the first very long and falcate, its height a little less than twice the length of head, the first 4 spines longest, the others much shorter, soft dorsal much lower, the highest rays contained about two times in head. Anal fin inserted a little anterior to insertion of soft dorsal; the first and last rays short, the middle ones greatly developed, their height a little more than length of head, the distal half of the longer rays extending beyond the membranes.

the free part becoming less as the rays grow shorter. When depressed, the rays of the dorsal extend a little farther posteriorly than do those of the anal, just reaching base of caudal. Posterior margin of caudal slightly convex. Pectorals and ventrals pointed.

Back with 5 indistinct, broad, dusky cross-bars; spinous dorsal with a dusky spot, other fins plain, the dorsal and anal dead white.

Type No. 50008, U. S. National Museum. Sagami Bay, dredged in about 60 fathoms by the U. S. Fish Commission steamer *Albatross*. Three other specimens similar in size and character were taken in Owari Bay.

(*Evolans*, flying away, from the high fins.)

9. PTEROPSARON VERECUNDUM Jordan and Snyder, new species.

Head $3\frac{1}{10}$ in length; depth $7\frac{1}{5}$; depth of caudal peduncle 6 in head; eye $3\frac{1}{2}$; snout $3\frac{4}{5}$; pectoral $5\frac{1}{5}$ in length; ventral $4\frac{1}{8}$; caudal $5\frac{1}{5}$; D. IV., I–17 or more; A. 22; scales in lateral line 30; in transverse series 6; between lateral line and insertion of spinous dorsal 2.

Body elongate, cylindrical. Head very long, snout sharp, somewhat spatulate, the lower jaw included. Eye large, its diameter slightly greater than length of snout, the upper edge projecting above

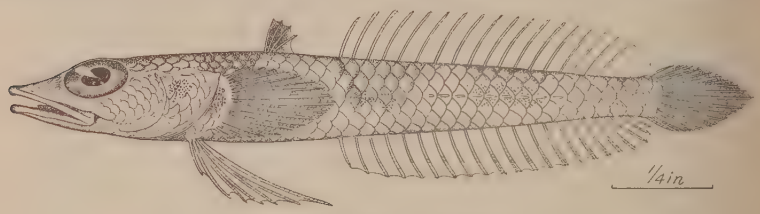

FIG. 3.—PTEROPSARON VERECUNDUM.

contour of head, the interorbital space a mere line between the eyes. Mouth large, the cleft somewhat oblique. Premaxillary very protractile, maxillary extending to a perpendicular through center of pupil. Teeth simple, in narrow bands of two or three rows on both jaws; no canines; no teeth on vomer or palatines. Gill-rakers on first are very small or absent. Opercle with a weak, flat spine, preopercle without spines, the edges smooth.

Body with large, smooth scales; cheeks, opercles, and occiput with thin, smooth scales. Lateral line straight, except at anterior part, where it is somewhat bent upward.

Dorsal fins well separated, the distance between them contained about $4\frac{1}{2}$ times in length of head; the spines of about equal length, the fourth a little shorter than the first, which is contained about 6 times in length of head; the rays higher than the spines, the longest contained about $3\frac{1}{2}$ times in head. Anal inserted directly below insertion of dorsal; the rays about as high as those of dorsal; pectorals and ventrals pointed.

Upper parts with 4 broad, dusky cross-bands, extending over the back and downward to the lateral line, the anterior band on nape, the posterior one on caudal peduncle; dorsal fin very dark; upper half of iris blue black.

The dorsal and caudal fins are injured, making a correct description of their outline impossible; the first dorsal is very low. Perhaps older or larger specimens might show vomerine or palatine teeth.

The type is numbered 50009, U. S. National Museum; collected in Suruga Bay, Japan, by the U. S. Fish Commission steamer *Albatross*. No other specimens were taken.

(*Verecundus*, modest.)

Family III. URANOSCOPIDÆ.

THE STAR-GAZERS.

Head large, broad, partly covered with bony plates. Body elongate, conic, subcompressed, widest and usually deepest at the occiput. Body either naked or covered with very small, smooth, adherent scales, which are arranged in very oblique series running downward and backward; the scales on the belly inconspicuous or obsolete. Lateral line little developed, running high. Eyes small, on anterior and upper portion of head, with vertical rings. Mouth vertical, with strong and prominent mandible; teeth moderate, on jaws, vomer, and palatines. Premaxillaries freely protractile; maxillary broad, without supplemental bones, not slipping under the preorbital. Gill openings wide, continued forward; gill membranes nearly separate, free from isthmus. Pseudobranchiæ present; 6 branchiostegals; 3½ gills, a slit behind the last; no anal papilla. Spinous dorsal very short or wanting; second dorsal long. Anal and pectorals large, the latter with broad oblique bases, the lower rays rapidly shortened, most of them branched; ventrals jugular, close together, I, 5, the spine very short, innermost ray longest; caudal not forked. Pterygials, according to Boulenger much reduced, fused with the hypercoracoid and hypocoracoid, hyperacoid with a foramen or fenestra; parapophyses strongly developed on most of the precaudal vertebræ, the ribs attached to their upper surface. Air bladder absent; pyloric cæca in moderate number. Vertebræ 24 to 26. Carnivorous fishes, living on the bottom of the shores of most warm regions.

a. *Uranoscopina*. Spinous dorsal separate from soft dorsal of 4 or 5 pungent species; scales present; very small fringes on opercle; no fringed humeral appendage; scapular spine long; lips and nostrils fringed; mouth with a retractile filament; top of head almost entirely bony, the occipital plate extending forward to the orbits ..... *Uranoscopus*, 5.

aa. Spinous dorsal not forming a separate fin.

b. *Ichthyscopina*. Humeral region with a fringed appendage; opercle conspicuously fringed; body scaly; chin without appendages; no barbel .... *Ichthyscopus*, 6.

bb. *Gnathagninæ.* Humeral region without fringed appendage; opercle not fringed; chin with saber-shaped dilatations of the rami of the mandible; no barbels.

c. Body scaly; preopercle without prominence at the angle; dilatations of lower jaw sharp at upper end ..... *Gnathagnus*, 7.

cc. Body naked; preopercle with a blunt prominence; dilatations of lower jaw without sharp point ..... *Ariscopus*, 8.

5. URANOSCOPUS Linnæus.

Uranoscopus LINNÆUS, Syst. Nat., 10th ed., 1758 p. 250 (*scaber*).

This genus includes those Uranoscopidæ which have the head largely bony above, the body scaly, the spinous dorsal developed, a humeral spine developed, and a retractile filament in the mouth below the tongue. (*οὐρανός*, heaven; *σκοπός*, looking.)

a. Scales large, about 36 in lateral series; head and trunk with rosy spots above; preopercle with 4 spines ..... *oligolepis*, 10.

aa. Scales rather small, 55 to 65 in the lateral line; spinous dorsal black.

b. Scales 64; head moderate; ground color of body forming brownish reticulations around whitish spots ..... *japonicus*, 11.

bb. Scales 56; head very broad; body more robust; ground color forming about two dark brown cross shades or broad bands ..... *bicinctus*, 12.

10. URANOSCOPUS OLIGOLEPIS Bleeker.

Uranoscopus scaber RICHARDSON, Ichth. China, 1846, p. 211; Canton (not of Linnæus).

Uranoscopus asper SCHLEGEL, Verh. Bat. Gen., XXV, Japan, p. 27; Nagasaki (not of Schlegel).

Uranoscopus oligolepis BLEEKER, Atlas Ichth., p. 425, Trig., pl. v., fig. 7; Sumatra, Amboina, Nagasaki.

Head 3; depth $3\frac{3}{4}$; D. V.– 13 or 14; A. 13 or 14; P. 16; scales 38.

Body rather elongate, broader than deep anteriorly; eye 5 to 6 in head, nearly as wide as interorbital space, no cirri at the chin; preopercle with 4 rough radiating spines; opercle granose; suprascapular spine oblique; upper humeral spine sulcate, twice diameter of eye, directed toward the middle of the spinous dorsal; dorsal fins near together, the soft rays much higher; caudal truncate-convex, not longer than head without snout. Color brownish rosy above, pearly or rosy below, no dark spots or cross bands; fringes dusky; head and trunk above with irregular yellowish or rosy spots; spinous dorsal black, yellowish at tip; soft dorsal dusky, with darker shades; anal with a median pearly line.

East Indies, Amboina, Straits of Sunda. One specimen in Bleeker's collection said to have come from Japan.

According to Bleeker the species differs from *Uranoscopus japonicus* (*asper*) not only in its scales, but also in the proportions of the height of the body, the length and breadth of the head, the number of preopercular spines, and the length and direction of the upper humeral spine.

(*ὀλιγός*, few; *λεπίς*, scale).

11. URANOSCOPUS JAPONICUS Houttuyn.

TEMONDAI-OKOSE (OBSERVATORY SCULPIN).

Uranoscopus japonicus Houttuyn, Holl. Maats. Wet. Harlem, 1782, p. 311; Nagasaki.—Jordan and Snyder, Proc. U. S. Nat. Mus., 1900, p. 745.

Uranoscopus asper Schlegel, Fauna Japonica, 1846, p. 26, pl. IX, fig. 1; Nagasaki.—Richardson, Ichth. China, 1846, p. 211.—Günther, Cat. Fish., II, 1860, p. 228; Japan.—Nystrom, Svensk. Vet. Akad., 1887, p. 28; Nagasaki.—Ishikawa, Prel. Cat., 1897, p. 46; Tokio, Kii.—Jordan and Snyder, Proc. U. S. Nat. Mus., 1900, p. 369; Tokio.

Head $3\frac{1}{5}$ in length; depth, $4\frac{1}{6}$; depth of caudal peduncle, $2\frac{4}{5}$ in head; eye, $5\frac{1}{3}$; interorbital space, 5; snout, 7; D. IV–14; A. 13; scales in lateral series 64.

Body robust, fusiform, compressed at caudal peduncle; head flat above, snout very short, mouth vertical; length of maxillary contained $2\frac{1}{10}$ times in head; teeth small, in a narrow band on upper jaw, in two rows on lower jaw, in villiform bands on vomer, palatines, and pharyngeals. Eyes small, located on upper side of head, directed obliquely upward. Gill rakers on first arch obsolete, represented by a few small bunches of setæ. Top and sides of head with moderately rugose bony plates; the dorsal plate extending forward between the eyes where it is divided by a deep depression; the preorbital plate with a blunt spine; preopercle with 3 blunt spines on lower edge, humeral spine of varying length, about 3 in head, a small blunt spine above the latter. Gill membrane with a fringe.

Scales small, square, deeply embedded; arranged in about 64 oblique rows; occiput, a narrow strip along base of dorsal, breast, belly, and a narrow area along anal fin, naked; lateral line extending along base of dorsal fin.

Dorsals separate, the spines very slender, the highest about 4 in head; anterior rays highest, 2 in head. Anal inserted below first ray of dorsal, the fin-membrane and especially the branched portion of the rays fleshy; caudal convex posteriorly; middle rays of pectoral longest; ventrals about $1\frac{1}{2}$ in head; a strong spine projecting forward from each side of base of fin.

Color in alcohol, yellowish white, the sides and upper parts brownish; on the dorsal parts of the head and body the brown color occurs in reticulations which map out whitish spots and rings of very irregular outline, those in the head much smaller than those in the body; spinous dorsal black; soft dorsal with small dusky spots along the rays; caudal and pectoral dusky, narrowly edged with white; anal with a little dusky color.

Coasts of Japan, generally common southward, here described from a specimen 250 millimeters long from Yokohama. We have many other examples from Wakanoura. It was also seen at Hakata, Misaki, and Tokyo.

12. URANOSCOPUS BICINCTUS Schlegel.

MEGANE-UWO (SPECTACLE FISH).

Uranoscopus bicinctus SCHLEGEL, Fauna Japonica, Poiss., 1846, p. 26, pl. x B; Nagasaki.—BLEEKER, Act. Soc. Nederl., II, Amboina, p. 411; Amboyna.—GÜNTHER, Cat. Fish., II, 1860, p. 228; Japan, China.—NYSTROM, Svensk. Vet. Akad., 1887, p. 28; Nagasaki.—ISHIKAWA, Prel. Cat., 1897, p. 46; Tokyo, Kagoshima.

Head 3 in length; depth $3\frac{4}{5}$; depth of caudal peduncle $3\frac{1}{6}$ in head; eye 6; interorbital space $4\frac{1}{2}$; snout $7\frac{1}{2}$; D. IV, 13; A. 13; scales in lateral series 56.

This species differs from the preceding in having the plates of the head much more rough, the interorbital space and the depression in the bony plate wider, and in color. No dark reticulations are present except on upper part of head and nape, where they are few and much broken up; a broad, dark band passing around body through base of spinous dorsal, the band inky black on the sides, dusky below; a large black spot below posterior end of base of dorsal; a similar spot on cheek; spinous dorsal inky black; soft dorsal, caudal, and pectorals dark, the soft dorsal and caudal narrowly tipped with white, the pectorals broadly edged with white; anal dusky, the tips of the rays white.

Coasts of Japan and southward, not very common. We have a specimen about 250 millimeters long from Misaki and a smaller one from Wakanoura.

(*Bis*, two; *cinctus*, banded.)

6. ICHTHYSCOPUS Swainson.

Ichthyscopus SWAINSON, Nat. Hist. Fish., etc., II, 1839, p. 269 (*inermis*).

Body robust, covered with small scales which are regularly arranged in oblique cross series; head large, entirely mailed above; cheeks naked, preopercle unarmed, covered with soft skin, fringed behind; humeral projection fringed; lower jaw without dilatations below; no filament at the chin or in the mouth; dorsal fin single; the spinous dorsal obsolete.

(*ἰχθύς*, fish; *σκοπός*, gazer.)

13. ICHTHYSCOPUS LEBECK (Schneider).

Uranoscopus lebeck SCHNEIDER, Syst. Ichth., 1801, p. 47; (Tranquebar, on a drawing by LeBeck, sent by the missionary, John).

Ichthyscopus lebeckii GILL, Proc. Ac. Nat. Sci. Phila., 1861, p. 114; name only.

Uranoscopus inermis CUVIER and VALENCIENNES, Hist. Nat. Poiss., III, 1829, p. 310, pl. LXV; Coromandel, Malabar, Pondicherry.—SCHLEGEL, Fauna Japonica, 1846, p. 27, pl. x*a*; Nagasaki.—GÜNTHER, Cat. Fish., II, 1860, p. 230; Ceylon, Madras.

Head $2\frac{3}{4}$ in length; depth $2\frac{4}{5}$; depth of caudal peduncle $3\frac{1}{2}$ in head; eye $8\frac{1}{2}$; interorbital space 5; snout $8\frac{1}{2}$; D. 19; A. 16; scales in lateral series about 45.

Head very large, deeper and broader than the body, flat above, the sides vertical; eyes placed on top of head, directed upward, the diameter of orbit equal to length of snout; mouth vertical; lips with prominent transverse ridges, the edges and ends of which are covered with small papillæ; a rather broad band of small teeth on upper jaw; a single row of widely separated, flat, sharp teeth on lower jaw; large plates with villiform teeth on vomer. Pseudobranchiæ very small; gill rakers absent, the first arch with minute, bony setæ; anterior and posterior nostrils with large, low, fringed tubes; opercle with a large flap posteriorly, the upper part with fringed filaments; two fringed flaps, the upper part of which is much the larger, above base of pectoral; their edges meeting, cover a deep depression, forming a tube leading from gill chamber; top of head with slightly rugose plates; depression between eyes very broad, the plates on either side narrow, pointed anteriorly; upper parts of preopercle and opercle with exposed rough plates; no spines.

Scales small, thin, embedded, arranged in oblique rows, the occiput, breast, belly, and head naked; lateral line high up on body near base of dorsal fin.

Spinous dorsal absent, there being but one weak spine before the soft rays; 2 or 3 anterior rays not branched; anal inserted below second or third dorsal ray, extending a little farther posteriorly than the dorsal; caudal convex posteriorly; pectoral large, the fifth and sixth rays longest, the rays below gradually shorter. Rays of anal, ventral and of lower part of pectoral much enlarged, fleshy, and with wrinkled skin near the tips.

Color in spirits, upper parts of body including the dorsal fin brownish, with round, white spots about as large as the orbit, those on dorsal in a row along basal part of fin, those on body in 2 rows, a third represented by 2 or 3 spots; head plain brownish above except opercles and preopercles, which are yellowish white, and the interorbital depression where the skin is covered with small, round, white spots; caudal dusky with elongate, light spot on its upper half; anal and pectorals dusky, bordered with yellowish white.

Described from a specimen about 300 millimeters long from Onomichi. We have other examples from Wakanoura and Hakata.

Coast of southern Japan and southward, rather rare.

(Named for LeBeck, "ardentissimo historiæ naturalis amatori," who figured for Bloch the dolphins of the Ganges.)

7. GNATHAGNUS Gill.

Gnathagnus GILL, Proc. Ac. Nat. Sci. Phila., 1861, p. 115 (*elongatus*).

Head largely bony above, the bones separated by smooth intervals; preopercle with bony cross-ridges, but no sharp spine; no prominence at its angle; opercle broad, with radiating striæ, its edge not fringed;

no fringed appendage to shoulder girdle; mouth vertical; lower jaw prominent, with a short, saber-like dilatation on each side at the chin; these with free pointed tip above; no barbel at the chin or within the mouth. Body covered with very small, smooth scales, which are not arranged in oblique series; humeral spine obsolete; spinous dorsal wanting; soft dorsal rather short; anal longer; ventrals far forward. Japan to Australia.

(*γνάθος*, jaw; *ἀγνός*, an old name for *Uranoscopus scaber*.)

14. GNATHAGNUS ELONGATUS (Schlegel).

Uranoscopus elongatus SCHLEGEL, Fauna Japonica, Poiss., 1846, p. 27, pl. IX, fig. 2; Nagasaki.

Anema elongatum GÜNTHER, Cat. Fishes, II, 1860, p. 230 (after Schlegel).

Head 3½ in length; depth 4¾; depth of caudal peduncle 3⅕ in head; eye 4⅔; interorbital space 3¼; snout 7; D. 13; A. 16.

Body elongate, head broader than body, about as deep, the upper part flat; eyes near top of head, directed obliquely upward, the diameter of orbit greater than length of snout; mouth vertical; teeth of upper jaw in a narrow band, those of lower jaw larger, in 2 rows, the vomer and pharyngeals with bands of villiform teeth. Pseudobranchiæ prominent; gill-rakers not present, a few small elevations on first arch covered with setæ. Anterior nostril with a short, slender barbel; anterior part of lower jaw with a sharp, flat spine on each side, directed upward; a short, flat, partly concealed humeral spine. Head with bony plates, which are rugose or covered with low, radiating ridges, the plates with naked spaces between them; preopercle with strong ridges, opercle with small, radiating striæ; interorbital depression broad, its width somewhat less than diameter of eye.

Body covered with minute scales, which are not deeply embedded, the belly and breast naked. Lateral line running along upper part of body, abruptly bending downward on caudal peduncle and extending on base of caudal fin.

Spinous dorsal absent, the soft dorsal short; anal inserted much in advance of dorsal and extending farther posteriorly, the rays much lower than those of the latter, their length about equal to depth of caudal peduncle; posterior edge of caudal convex; pectoral broadly rounded posteriorly, contained about 4⅚ times in length; ventrals 7 in body.

Dusky above, covered with small, round, brown spots on head and body, lighter below, without spots; dorsal, anal, and ventrals with a little dusky color, the pectorals and caudal dark, lighter on the margins.

Coasts of Japan, very rare. A single specimen from Aomori was presented to us by Mr. Sotaro Saito, curator of the Aomori Museum. It is otherwise known from Nagasaki only.

(*Elongatus*, elongate.)

8. ARISCOPUS Jordan and Snyder, new genus.

Ariscopus Jordan and Snyder, new genus (*iburius*).

This genus is close to *Gnathagnus*, from which it differs in the absence of scales. Minor characters are the stouter form, the absence of a sharp point on the saber-like dilatation of the lower jaw, and in the presence of a blunt prominence on the angle of the preopercle.

(ἄρι, an intensive particle; σκοπός, gazer.)

15. ARISCOPUS IBURIUS Jordan and Snyder, new species.

Head $2\frac{4}{5}$ in length; depth $3\frac{3}{5}$; depth of caudal peduncle $3\frac{1}{4}$ in head; eye $4\frac{1}{8}$; snout $6\frac{2}{3}$; interorbital space $2\frac{1}{2}$; D. 12; A. 17; P. 22.

Body robust, slightly deeper than head, the caudal peduncle deep, compressed; head broader than body, flat above, the sides vertical. Eyes large, the diameter greater than length of snout, placed high up, directed obliquely; interorbital space slightly concave, the width of depression in occipital plate equal to diameter of eye, its posterior edge on a horizontal between pupil and posterior edge of orbit.

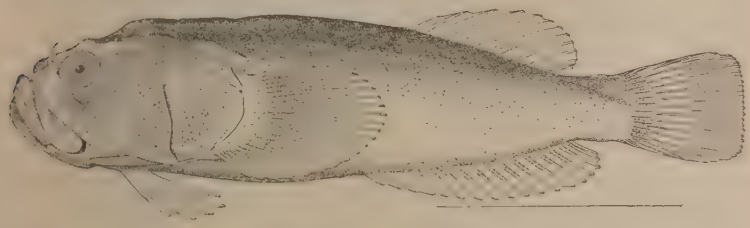

Fig. 4.—Ariscopus iburius.

Mouth vertical, maxillary contained 2 times in head, extending posteriorly to a vertical through pupil, the upper edge sliding beneath the preorbital; the lips without fringes; teeth simple, sharp, depressible, those on the upper jaw in a narrow band, on the lower jaw in 2 rows anteriorly, a single row posteriorly; villiform teeth on vomer and pharyngeals. Gill-rakers represented by a few small elevations, the pseudobranchiæ prominent.

Body naked; lateral line running along upper part of body, gradually approaching the dorsal median line until the base of last dorsal ray is reached, where it abruptly bends downward to middle of base of caudal fin; head with plates on the top, their surfaces rugose or with radiating lines and sides; those on the top without any interspaces, fused together into one large plate, extending forward to anterior edges of orbits, the posterior edge straight; a row of narrow, rough plates extending from eye to upper edge of gill-opening, where it ends in a flat humeral spine; suborbital and preorbital plates prominent, preopercle with radiating ridges, the angle with a blunt prominence;

no spines on head; lower jaw with a partly concealed, saber-like attachment on either side, as in *Gnathagnus elongatus*, but without sharp spines; anterior nostril with a large tube, the posterior part of which has a slender filament.

Spinous dorsal absent; median rays of soft dorsal highest, their length a little greater than depth of caudal peduncle; caudal truncate posteriorly, its length 4½ in body; anal inserted in advance of the dorsal, the thirteenth or fourteenth ray longest, contained about three times in head, the rays when depressed reaching farther posteriorly than do those of the dorsal, neither touching base of caudal; pectoral rounded, its length 4¼ in body; ventrals pointed, 2 in head.

Color in spirits, silvery white, brownish above, with many small, dark brown spots separated by narrower interspaces, the spots extending forward on head and snout; sides of head with minute, dark specks; fins with a little dusky color, the caudal and pectorals darker toward their bases.

Described from a specimen 73 millimeters long, type No. 6544 Leland Stanford Junior University Museum, from Tomakomaki in the province of Iburi, Hokkaido. A second specimen from Volcano Bay is in the museum at Hakodate.

Family IV. CHAMPSODONTIDÆ.

We place provisionally in a separate family a single genus, *Champsodon*, apparently allied on the one hand to *Uranoscopus* and on the other certainly to the Chiasmodontidæ with which Dr. Boulenger places it. But the real affinities of *Chiasmodon* are equally uncertain. The family characters are included below.

9. CHAMPSODON Günther.

Champsodon GÜNTHER, Proc. Zool. Soc. Lond., 1867, p. 102 (*vorax*).

Body rather elongate, fusiform, covered with small, rough, warty, scarcely imbricate scales; belly naked; head flat above, with vertical sides; cheeks and snout scaly; the eyes rather small, high, and near together; mostly directed upward; a small cilium over each eye; mouth large, very oblique, the lower jaw projecting; both jaws with slender teeth of unequal size, some of those below longest; many of them long, slender, depressible canines; a few teeth on vomer; none on palatines; upper jaw with a double notch at tip; preopercle with a strong, curved spine at its angle, the spine about as long as eye; the ascending limb with small teeth; opercle rounded, unarmed; preorbital broad, with a flat, three-lobed spine. Top of head with a low ridge on each side from snout to nape; gill-openings wide, the gill membranes separate, free from the isthmus; isthmus long and narrow, not forming a hump, gill-rakers slender, of moderate length; gills 4, a slit behind the

fourth; suborbitals not dilated; lateral lines 2, the lower curved upward over pectoral; both with lateral vertical branches; the cross rows of tubes on the back more conspicuous than the lateral lines; dorsal fins 2, the first short, the second long, similar to anal; pectoral small and narrow, placed high; ventrals I, 5, the middle rays longest, inserted before pectorals, but joined to the shoulder girdle by ligament only; caudal forked.

Offshore fishes of the coasts of Asia.

(*Χάμψαι*, crocodile; *ὀδούς*, tooth.)

16. CHAMPSODON VORAX Günther.

Champsodon vorax Günther, Proc. Zool. Soc. Lond., 1867, p. 102; Shore Fishes, Challenger, 1880, p. 52, pl. xxiii, fig. a; Philippines, Nares Bay, Admiralty Islands, Arafura Sea, Ki Islands; Deep Sea Fishes, Challenger, p. 49; Coast of Japan, Philippines, etc.—Alcock, Ann. Mag. Nat. Hist., 1889, p. 381; Bay of Bengal.—Goode and Bean, Oceanic Ichthyology, p. 291.

Head 3⅔ in length, depth 5⅓; depth of caudal peduncle 4⅓ in head; eye 4½; snout 3⅔; interorbital space 6½, D. V., 20; A. 19

Body rather elongate, fusiform in outline, compressed laterally, the caudal peduncle rather narrow. Head large, about as deep as body, the top flat, the sides vertical. Eye placed high in head, directed obliquely upward; interorbital space narrow, concave. Snout slightly longer than diameter of eye. Mouth oblique, the lower jaw projecting, the upper with a double notch at the tip; maxillary extending past eye a distance equal to half the diameter of eye. Teeth long, slender, curved, in two series, the inner ones much enlarged; a small cluster of slender teeth on each side of vomer; none on the palatines; basi-branchials and upper and lower pharyngeals with teeth. Gill rakers, long, slender, pointed, 2 + 10 on first arch. Upper part of head with 2 small bony ridges extending from snout along upper border of eyes, diverging on occiput and ending in a spine on each side at upper edge of gill opening; preopercle with a slender, curved, knife-like spine at its angle; below this 2 or 3 small spines; upper limb of preopercle with minute spines; opercle ending in a soft ciliated flap; preorbital broad, with a strong, three-lobed spine. A small cilium on upper part of eye.

Body covered with small, very rough, scarcely imbricate scales, except on belly, where there is a naked area; head completely scaled except edge of opercle. Two lateral lines, both with vertical branches.

Dorsal spines slender, weak, the first highest, about 3 in head, the others gradually lower. Anal inserted below third dorsal ray, the fin when depressed extending as far posteriorly as the dorsal, just reaching base of caudal. Caudal fin deeply notched. Pectorals small, their length about 2⅓ in head. Ventrals pointed, 1⅓ in head.

Color dark steel blue above, sides silvery, mottled with darker, tip

of lower jaw dusky; caudal yellowish, its base blackish; other fins rather pale.

Here described from a specimen 100 millimeters in length from Wakanoura.

East Indian region in rather deep water, north to Japan. Many specimens were collected by us in Waka Bay at Wakanoura. Four others were dredged by the U. S. Fish Commission steamer *Albatross* in Suruga Bay off Enoura. Length 65 to 105 millimeters.

(*Vorax*, voracious.)

Family V. TRICHODONTIDÆ.

THE SAND-FISHES.

Body rather elongate, compressed, naked. Head short, flat on top, the sides vertical. Eyes large, high up, but not superior. Mouth large, almost vertical; lower jaw projecting, its tip entering the profile; lips fringed; premaxillaries protractile; maxillary very broad, without supplemental bone, not slipping under the very narrow preorbital. Teeth moderate, slender and sharp, but not setiform, in bands on jaws and vomer; palatines toothless; inner teeth of jaws depressible. Gill rakers short, slender; gill membranes narrowly united, free from the isthmus. Branchiostegals 5. Gills 4, a slit behind the fourth. Pseudobranchiæ large. Preopercle with 5 prominent spines, the 2 upper directed strongly upward, the 2 lower downward, the middle 1 downward and backward; no barbels; opercle small; strongly striate, unarmed; preorbital with spines; no suborbital stay. Lateral line obsolete. Dorsal fins separate, the first the larger, of numerous slender spines; anal fin elongate, without distinct spines, the rays of anterior third of the fin much shorter than the others, the beginning of the fin below middle of spinous dorsal; pectorals with a very broad, curved, procurrent base; a broad lunate area between pectoral and gill opening, nearly covered by the opercle; soft rays of dorsal, anal, and pectoral fins all simple; ventrals I, 5, close together, thoracic, but behind the pectorals, the middle rays longest; caudal lunate, with many accessory rays, on a slender peduncle. Vertebræ numerous, 48 in typical species. North Pacific; living in sand near the shore. The fringed lips and other characters seem to indicate the relationship of these fishes with the *Uranoscopidæ*, but according to Dr. Boulenger these indications are fallacious and the place of the family is next the *Latrididæ*.

a. First dorsal long and rather low, of 14 or 15 spines ..... *Trichodon*, 10.
aa. First dorsal short and high, of 10 spines ..... *Arctoscopus*, 11.

10. TRICHODON (Steller).

SAND FISHES.

Trichodon STELLER, in Tilesius, Mem. Acad. St. Petersburg, IV, 1811, p. 468 (*trichodon*).

Trichodon CUVIER, Règne Animal, 2d ed., II, 1829, p. 140 (*trichodon*).

Characters of the genus included above, the first dorsal long and rather low, of 15 spines. One species.

(*θρίξ*, hair; *ὀδούς*, tooth.)

17. TRICHODON TRICHODON (Tilesius).

HATA-HATA[1] (FLAPPER)

Trachinus trichodon TILESIUS, Mem. Acad. St. Petersburg, IV, 1811, p. 473, pl. xv, fig. 88; Kamchatka.—PALLAS, Zoographia Rosso-Asiatica, III, 1811, p. 235.

Drachinus trichodon TILESIUS, Mem. Acad. St. Petersburg, IV, 1811, p. 406; name only.

Trichodon stelleri CUVIER and VALENCIENNES, Hist. Nat. Poiss., III, p. 154, pl. LVII, 1829; based on *Trachinus trichodon*—GÜNTHER, Cat., II, 1860, p. 251—JORDAN and GILBERT, Synopsis, 1883, p. 627.—ISHIKAWA, Prel. Cat., 1897, p. 46; Hokkaido.

Trichodon trichodon JORDAN and EVERMANN, Fish. N. and M. Amer., III. 1898, p. 2295, fig. 806; Herendeen Bay, Monterey, Shumagin Islands.

Trachinus gasteropelecus TILESIUS, Mem. Acad. St. Petersburg, IV, 1811, p. 466; Kamchatka.

Trichodon lineatus AYERS, Proc. Ac. Nat. Sci. Phila., 1860, p. 60; San Francisco; D. XV—18; A. 28; P. 23.

Head from tip of upper jaw, 3⅘; depth 3½. D. XIII—I, 18; A. 28; P. 22; eye 4⅓ in head, snout 4½; maxillary 2; interorbital 3; pectoral 1⅛; ventral 1⅘; height of spinous dorsal 3⅙.

Body moderately elongate, compressed; dorsal outline slightly concave and sloping gently upward from snout to dorsal, thence turning at a very slight angle nearly straight to caudal; ventral outline well rounded from chin to caudal peduncle, the curve much more gradual posteriorly; head and body everywhere covered with thin naked skin. Mouth large, superior, nearly vertical, the lower jaw projecting, its tips entering the profile; lips fringed; maxillary reaching to middle of pupil; teeth in 2 or 3 rows, small, sharp, and recurved; teeth on vomer; palatines toothless. Eyes placed high, their diameter equal to length of snout; interorbital wide and flat, a third wider than eye; top of head smooth, sometimes rugose in younger individuals, covered with thin smooth skin; anterior nostril ending in a tube; preopercle with 5 spines, the one at angle largest, the 2 upper ones pointing upward and backward, the middle one pointing downward and backward, the 2 lower ones pointing downward and forward; opercle with radiating ridges; gill rakers short and slender, numerous.

Origin of spinous dorsal behind base of pectoral, its distance from

[1] This name denotes the flapping of a bird's wings.

snout 3 in body, the spines not varying greatly in length, the last one connected by a membrane to the back; soft dorsal well separated from spinous, its rays about equal to spines in length, highest in front; anal long, its origin nearer to the snout than base of caudal by a distance equal to the length of the eye. Pectoral, when spread, broadly rounded behind, its lower rays rapidly decreasing in size below, reaching well past front of anal; ventrals inserted behind base of pectorals a distance equal to $\frac{2}{3}$ eye, their tips reaching to vent. Lateral line running high. Vertebræ 17+30=47.

Color silvery, light brown above; a dark brown streak following the lateral line, broken up into spots anteriorly; quadrangular, dark brown marks along the back at base of dorsals, chain-like markings in front of dorsal on nape; snout and tip of lower jaw dark; a dark line at lower part of eye; dorsals light, a dark streak along upper part of spinous dorsal; pectorals dusky; ventrals and anal colorless. Length 200 to 250 millimeters.

North Pacific, on sandy shores, from Bering Sea to Monterey, California, and to Hokkaido in Japan; very abundant northward; burying in the sand. Here described from a specimen from Herendeen Bay, Alaska. (U. S. Fish Commission steamer *Albatross* collection.)

We have seen no Japanese specimens, but Ishikawa records it from Hokkaido.

11. ARCTOSCOPUS Jordan and Evermann.

Arctoscopus Jordan and Evermann, Check-List Fishes, 1896, p. 464 (*japonicus*).

This genus differs from *Trichodon* in the short, high, triangular spinous dorsal, which is composed of 10 spines.

(ἄρκτος, northern; σκοπός, gazer; for *Uranoscopus*.)

18. ARCTOSCOPUS JAPONICUS (Steindachner).

HATA-HATA (FLAPPER).

Trichodon japonicus Steindachner, Ichth. Beitr., X, 1881, p. 4; Strielok, near Vladivostok, Sitka.—Jordan, Cat. Fishes N. A., 1885, p. 117.

Arctoscopus japonicus Jordan and Gilbert, Rept. Fur Seal Investig., III, 1898, p. 479; Iturup Island, Kurile Group.—Jordan and Evermann, Fish. N. and M. Amer., III, 1898, p. 2297, fig. 867; Iturup Island.

Head $3\frac{3}{4}$ in length, depth $3\frac{1}{4}$; depth of caudal peduncle $3\frac{2}{3}$ in head; eye $3\frac{1}{4}$; snout $1\frac{2}{3}$; interorbital space $6\frac{2}{3}$; D. X. 13; A. 31.

Body deep, greatly compressed, the caudal peduncle narrow. Head rather large, the top flat, the sides sloping inward toward the ventral part; bones of head thin, cavernous; eye large, its diameter greater than length of snout; interorbital space flat, equal in width to pupil; preorbital narrow. Mouth almost vertical, the maxillary extending about to center of pupil, its length contained about 2 times in head; premaxillary protractile; teeth on jaws small, in narrow bands; a

small patch on each side of vomer; pharyngeals smooth. Pseudobranchiæ large; gill rakers on first arch 5 + 14, long and slender. Preopercle with 5 large, slender spines, the central and largest one being on the angle; preorbital with a small spine which projects downward; opercle without armature. In our specimens, which are not well preserved, no scales can be detected on the head or body. Lateral lines single, without branches, passing along upper side of body; no trace of a second lateral line can be detected.

Dorsals widely separated; the first spines highest, about $1\frac{5}{6}$ in head; base of second dorsal but little longer than that of the first, the rays somewhat shorter than the spines, when depressed falling far short of base of caudal. Anal fin very long, inserted below eighth dorsal spine, extending to base of caudal, the highest rays contained about $3\frac{1}{3}$ times in head; caudal concave posteriorly; the basal rays extending far forward on caudal peduncle. Pectorals very large, the length contained about $3\frac{1}{2}$ times in length of head and body, the posterior edge truncate.

Color in spirits silvery, with small brownish spots on upper parts; a row of elongate, paired spots along the lateral line. Dorsals, caudal, and pectorals dusky.

Described from a specimen from Kushiro about 120 millimeters long.

North Pacific, rare; recorded from Strielok, Sitka, and Iturup Island. We have in addition 3 specimens from Kushiro, Hokkaido, and one from Tsugaru, near Aomori. The latter is No. 791, *Trichodon* sp., of Ishikawa's list, the specimen being presented by the Imperial Museum. (*Japonicus*, from Japan.)

Family VI. SILLAGINIDÆ.

Body elongate, little compressed, tapering both ways from the spinous dorsal; head rather elongate, conical in profile, the forehead flattened. Eyes lateral, submedian, the preorbital very large, concealing ends of maxillaries. Mouth small, terminal, the premaxillary little protractile. Teeth small, on jaws and front of vomer. Branchiostegals 6; pseudobranchiæ present. Preopercle entire, bent inward below, covering lower surface of head; opercle small, with a short spine. Skull with muciferous cavities as in *Sciænidæ*. Scales small, ctenoid. Lateral line simple, slightly curved, continued to base of caudal or slightly beyond. Dorsal fins 2, the first short, the second very long, similar to anal which has two small spines; caudal emarginate, with rounded lobes; pectorals normal; ventrals 1, 5; thoracic fins almost scaleless. Vertebræ 12 to 16 + 22 to 27. Stomach cæcal, pyloric cæca few. Air bladder simple. Fishes of the East Indian seas, distantly resembling the *Sciænidæ*, which are certainly their nearest allies.

a. Teeth uniform; dorsal spines 11 or 12; soft dorsal similar to anal; scales rather small (50 to 90); ventral spine slender .... *Sillago*, 12.

12. SILLAGO Cuvier.

Sillago Cuvier, Règne Animal, 1st ed., II, 1817, p. 258 (*sihama=acuta*).

This genus includes most of the species of the family, including all those with villiform teeth, the soft dorsal and anal similar to each other, the scales small, and the ventral spine normal.

(Name unexplained.)

a. Scales 68 to 75.

b. Scales between lateral line and insertion of dorsal in 4 rows; cheek scales cycloid; D. XI—I, 20 or 21; A. II, 22 or 23; soft dorsal not spotted ..... *sihama*, 19.

bb. Scales between lateral line and insertion of dorsal in 3 rows; cheek scales ctenoid; D. XI—I, 22; A. II, 23 ..... *japonica*, 20.

aa. Scales 82 to 86; seven rows above lateral line, scales of cheek ctenoid; D. XII—I, 22; A. II, 23; soft dorsal spotted ..... *parvisquamis*, 21.

19. SILLAGO SIHAMA (Forskål).

KISUGO.

Atherina sihama Forskål, Descript. Anim., etc., 1775, p. 70; Red Sea.

Platycephalus sihamus Schneider, Syst. Ichth., 1801, p. 60.

Sillago sihama Rüppell, Atlas Reise, N. A., p. 9, pl. iii, fig. 1; Red Sea.—Günther, Cat. Fish., II, 1860, p. 244; Red Sea, Ceylon, Amoy, Philippines, Nepal, Malayan Peninsula.—Gill, Proc. Ac. Nat. Sci. Phila., 1861, p. 504.—Jordan and Snyder, Fishes Formosa, MS.; Formosa.

Sciæna malabarica Schneider, Syst. Nat., 1801, p. 81, pl. xix; Malabar.

Sillago malabarica Gill, Proc. Ac. Nat. Sci. Phila., 1861, p. 504.

Sillago acuta Cuvier and Valenciennes, Hist. Nat. Poiss., III, 1829, p. 400; Tranquebar, Pondicherry, Bengal, Java.

Sillago erythræa Cuvier and Valenciennes, Hist. Nat. Poiss., III, 1829, p. 409; Red Sea, Suez, Massuah.

Head, $3\frac{1}{2}$ in length, depth, $6\frac{1}{2}$; depth of caudal peduncle, $4\frac{1}{2}$ in head; eye, 5; snout, $2\frac{2}{5}$; interorbital space, $5\frac{1}{2}$; pectoral, $7\frac{1}{2}$ in length; ventral, $7\frac{1}{2}$; caudal, 6; D. XI –I, 20; A. II, 23; scales in lateral line, 69; in transverse series, 14; between lateral line and insertion of dorsal, 4.

Body elongate, slightly compressed, the caudal peduncle narrow; ventral contour almost straight, the dorsal outline rising evenly and gently from snout to dorsal fin; head elongate, the snout long and sharp. Eye large, located midway between tip of snout and edge of opercle; interorbital space slightly convex. Mouth small, somewhat oblique, maxillary contained $4\frac{3}{4}$ times in head. Bands of minute, simple teeth on both jaws, an outer single row of enlarged ones both above and below, but no canines; a broad patch of vomerine teeth present. Gill-rakers on first arch, 4 or 5 + 9, short, slender; preopercle with a few broad, weak spines.

Body covered with finely ctenoid scales, occiput, cheeks and throat with smooth scales, the snout smooth; basal half of caudal with minute scales, the other fins smooth. Lateral line complete, passing along upper part of body, then bending downward to middle of caudal peduncle.

Dorsals separate, the spinous dorsal inserted on a line passing a little behind base of ventrals, the soft dorsal inserted immediately above anal, both fins extending an equal distance posteriorly; caudal notched, pectorals and ventrals pointed.

Color in spirits, plain brownish yellow, a faint trace of dusky on the distal parts of the fins.

Coast of India, from the Red Sea to Japan, generally common; our specimens from Tokyo, Tsuruga, Onomichi, and Formosa. It is apparently much less common than *S. japonica*, on the coasts of Japan. Dr. Gill separates *S. malabarica* as a distinct species having the soft dorsal spotted. Our specimens agree with *S. sihama* in this regard. (*Sihama*, an Arab name.)

20. SILLAGO JAPONICA Schlegel.

AOGISU (BLUE KISUGO).

Sillago japonica Schlegel, Fauna Japonica Poiss., 1846, p. 33, pl. x, fig. 1; Nagasaki.—Bleeker, Act. Nederl. Sooc., Indo-Nederl., III, Japan, p. 11.; Bali, III, p. 163; Bali.—Gill, Proc. Ac. Nat. Sci. Phila., 1861, p. 504.—Steindachner and Döderlein, Fische Japans., III, 1884, p. 24; Tokyo.—Nystrom, Svensk. Vet. Ak., 1887, p. 29; Nagasaki.—Ishikawa, Prel. Cat., 1897, p. 46; Tokyo, Kishin.—Jordan and Snyder, Proc. U. S. Nat. Mus., 1900, p. 369; Tokyo.

Head $3\frac{4}{5}$ in length; depth $5\frac{2}{3}$; depth of caudal peduncle $3\frac{1}{3}$ in head; eye $4\frac{1}{2}$; snout $2\frac{1}{2}$; interorbital space $4\frac{1}{2}$; pectoral $6\frac{3}{4}$ in length; ventral $7\frac{2}{3}$; caudal $6\frac{1}{2}$; D. XI—I, 22; A. II, 23; scales in lateral line 70; in transverse series 16; between lateral line and insertion of dorsal 3.

This species closely resembles *S. sihama*, differing from it mainly in having the scales of the head ctenoid, and in having larger scales above the lateral line, there being but three series between lateral line and insertion of dorsal.

Coasts of Japan and southward to Molucca; everywhere common, especially southward from Matsushima; an important food-fish. Our specimens are from Hakodate, Matsushima, Tokyo, Misaki, Niigata, Tsuruga, Wakanoura, Hiroshima, Onomichi, Kawatana, Hakata, and Nagasaki.

21. SILLAGO PARVISQUAMIS Gill.

Sillago parvisquamis Gill, Proc. Ac. Nat. Sci. Phila., 1861, p. 505; Kanagawa, near Yokohama.

Head $3\frac{2}{3}$ in length; depth $6\frac{1}{2}$; depth of caudal peduncle 4 in head; eye $5\frac{1}{2}$; snout $2\frac{1}{3}$; interorbital space $4\frac{1}{2}$; pectoral 7 in length; ventral $7\frac{1}{2}$; caudal 7; D. XII—I, 22; A. II, 23; scales in lateral line 82; in transverse series 17; between lateral line and insertion of dorsal 6.

Sillago parvisquamis is easily distinguished from *S. sihama* by the smaller scales on body, there being a larger number in the lateral line and between the insertion of dorsal and lateral line. The scales of the

head in this species are ctenoid. Another prominent mark of distinction is a series of 3 rows of small dusky spots on the rays of the soft dorsal.

Coast of Japan, thus far recorded only from Tokyo Bay, where our two specimens were taken.

(*Parvus*, small; *squama*, scale.)

Family VII. LATILIDÆ.

Body more or less elongate or compressed. Head subconical, the anterior profile usually convex; suborbital without bony stay; the bones not greatly developed; cranial bones not cavernous; opercular bones mostly unarmed. Mouth terminal, little oblique; teeth rather strong; no teeth on vomer or palatines; the premaxillary usually with a blunt posterior canine, somewhat as in the *Labridæ;* premaxillaries protractile; maxillary without supplemental bone, not slipping under the edge of the preorbital. Gills 4, a long slit behind the fourth; pseudobranchiæ well developed; gill membranes separate, or more or less united; lower pharyngeals separate. Scales small, ctenoid; lateral line present, complete, more or less concurrent with the back; dorsal fin relatively long and low, usually continuous, the spinous portion always much less developed than the soft portion, but never obsolete; anal fin very long, its spines feeble and few; caudal fin forked; tail homocercal; ventrals thoracic I, 5, close together; pectoral fins not very broad, the rays all branched; vertebræ in normal or slightly increased number (24 to 30). Pterygials long, hour-glass shaped, resting on both coracoids. Pyloric cœca few or none. Fishes of the temperate and tropical seas, some of them reaching a large size. Boulenger places these fishes with the Pseudochromididæ, and most late writers with the Malacanthidæ. There is no evidence of any close relationship to either, and we provisionally give the group family rank.

a. Latilinæ.—Soft dorsal and anal moderate, each of 13 to 15 soft rays; preopercle denticulate; scales small; form robust; nape and lips without adipose appendages.
Latilus, 13.

13. LATILUS Cuvier and Valenciennes.

Coryphænoides Lacépède, Hist. Nat. Poiss., III, 1802, p. 176, (*houttuynijaponicus*) (not of Gunner, a genus of *Macrouridæ* of prior date).

Latilus Cuvier and Valenciennes, Hist. Nat. Poiss., V, 1830, p. 368, (*argentatus*).

Body rather elongate, compressed, covered with small silvery, finely ciliated scales. Mouth horizontal, moderate, the jaws subequal; eye large, lateral; jaws with villiform teeth, besides a posterior canine; no teeth on vomer or palatines; preopercle serrate, opercle entire. Pseudobranchiæ present. Branchiostegals six. No adipose appendage on nape; no appendage to the lips. Dorsal rays about VII–14,

the fin continuous; anal rays II, 11. Air bladder simple; pyloric cæca few. East Indies.

(Name unexplained, perhaps from *latus*, broad.)

22. LATILUS JAPONICUS (Houttuyn).

AMADAI (SWEET PERCH OR LADY PERCH), KUSUNA.

Coryphæna japonica HOUTTUYN, Holl. Maats. Weet. Harlem, XX, 1782, p. 311; southern Japan.

Latilus japonicus JORDAN and SNYDER, Proc. U. S. Nat. Mus., 1901, p. 745 (identification of Houttuyn)—JORDAN and SNYDER, Fishes of Formosa, MS; Giran, Formosa.

Coryphænoides houttuyni LACÉPÈDE, Hist. Nat. Poiss., III, 1802, p. 176 (after Houttuyn).

Coryphæna sinensis LACÉPÈDE, Hist. Nat. Poiss., III, 1802, pp. 176, 209; on a Chinese painting.

Latilus sinensis JORDAN and SNYDER, Proc. U. S. Nat. Mus., 1901, p. 369; Tokyo.

Latilus argentatus CUVIER and VALENCIENNES, Hist. Nat. Poiss., V, 1830, p. 369; locality uncertain; IX, p. 495, Japan.—SCHLEGEL, Fauna Japonica, 1846, p. 63, pl. XXVIII, fig. 2; Nagasaki.—BLEEKER, Verh. Bat. Gen., XXVI, p. 85.—GÜNTHER, Cat. Fish., II, 1870, p. 252; China.—NYSTROM, Svensk. Vet. Ak., 1887, p. 29; Nagasaki.—ISHIKAWA, Prel. Cat., 1897, p. 45; Tagato, Nagato.

Head $3\frac{2}{5}$ in length; depth $3\frac{1}{2}$; depth of caudal peduncle $2\frac{1}{8}$ in head; eye 4; snout $2\frac{1}{3}$; interorbital space 4; pectoral $3\frac{5}{6}$ in length; ventral $6\frac{1}{3}$; caudal $4\frac{1}{4}$; D. 21; A. 14; scales in lateral line 70; in transverse series 25.

Body elongate, compressed, the caudal peduncle deep; ventral contour almost straight, dorsal contour very steep on snout, rounded above eye, then passing gently upward and backward to insertion of dorsal fin. Eye large, in upper part of head, equidistant from tip of snout and posterior edge of opercle; interorbital space convex, suborbital broader than the diameter of eye. Anterior nostril with a low rim. Jaws subequal, the lower slightly included; cleft of mouth almost horizontal; maxillary partly concealed by the suborbital, extending to a vertical through center of pupil, the length $2\frac{1}{3}$ in head; premaxillaries very protractile. Teeth of the upper jaw in 2 series, an outer single row of enlarged teeth, and an inner narrow band of minute ones; those of the lower jaws similar, the inner band confined to the anterior part of jaw, the outer row extending backward; 1 or 2 of the posterior teeth of upper jaw canine-like. Gill rakers on first arch 7 + 13, long and slender near middle of arch, becoming very small at the ends; pseudobranchiæ large. Posterior edge of preopercle finely denticulate.

Body covered with finely ctenoid scales, except on upper anterior parts and on breast, where the scales are cycloid; occiput, preopercle, and opercle with cycloid scales; those on the occiput very small; interorbital space, snout, suborbital and jaws naked. Lateral line not very distinct, extending along upper part of body on the seventh or

eighth row of scales below dorsal fin; minute scales extending a short distance on base of pectoral, and on the basal half of caudal; membranes of other fins without scales.

Insertion of dorsal fin immediately above base of pectoral, the first ray somewhat shorter than diameter of eye, other rays gradually longer to the third from the last, which is contained about $1\frac{2}{3}$ times in length of head. Anal inserted below eleventh ray of dorsal, similar in shape to dorsal, the longest or next to last ray $1\frac{3}{4}$ in head. Caudal subtruncate, the upper and middle rays slightly longer than the lower ones. Pectorals sharply pointed, of peculiar shape; the upper rays consecutively longer from the upper edge to middle of fin, the ray below the long central one abruptly shortened, about one-third the length of the latter; the others growing consecutively shorter. Ventrals bluntly pointed.

Color in alcohol, pale pinkish brown with numerous, narrow, dusky, vertical bands on upper parts of body. Fins dusky toward the margins.

Here described from a specimen about 290 millimeters long collected at Nagasaki.

In life, the upper parts of head and body are bluish, suffused with red, becoming brassy anteriorly, the latter color reflected from other parts of body in a less intense degree; dorsal fin suffused with red; membranes of anal transparent at base, dead white with a bluish reflection on other parts; pectoral similar to anal; ventral suffused with red.

Shores of China and southern Japan; a common food fish of the clear waters, reaching a length of about 600 millimeters. Our numerous specimens are from Nagasaki, Wakanoura, Tokyo, and Giran, Formosa.

Family VIII. PSEUDOCHROMIDIDÆ.

Head and body oblong, covered with moderate-sized, ciliated scales; lateral line interrupted of the two parts, the posterior part lower down; cleft of mouth oblique, the lower jaw longest; teeth cardiform; sides of head unarmed; preopercle entire; eyes lateral. Dorsal fin single, with a few spines in advance. Ventrals thoracic, I, 5; pectoral rays branched. Gill membranes united. No pyloric cæca; pseudobranchiæ and air bladder present. Tropical fishes, perhaps allied to the Serranidæ, having considerable in common with *Gramma*, *Rhegma*, *Plesiops*, and other genera with interrupted lateral line.

a. Palatines without teeth; dorsal spines 2; anal spines 3 ..... *Cichlops*, 14.

14. CICHLOPS Müller and Troschel.

Cichlops Müller and Troschel, Horæ Ichthyol., III, p. 24 (*cyclopthalmus*).
Labracinus Schlegel, Ms., Bleeker, Ac. Neérl. Sci., 1875, p. 5 (*cyclophthalmus*).

This genus is separated from *Pseudochromis* chiefly by the absence of palatine teeth.

(*Cichla*, a genus of South American river-fishes, from κίχλη, a thrush, a name applied to the black Wrasse; ὤψ, appearance.)

23. CICHLOPS CYCLOPHTHALMA Müller and Troschel.

Cichlops cyclophthalmus Müller and Troschel, Hor. Ichth., III, p. 24, pl. iv, fig. 1, Sunda Sea.—Günther, Cat. Fish., II, 1860, p. 259.—Bleeker, Act. Soc. Neerl., 1875, p. 8; Celebes.
Cichlops japonicus Gill, Proc. Ac. Nat. Sci. Phila., 1859, p. 147; Shimoda.

D. II, 25; A. III, 14; P. 19; V. I, 5; scales 52.

The Japanese specimen called *Cichlops japonica* is close to *Cichlops cyclophthalma* Müller and Troschel, described from the Sunda Sea. According to Gill "it is chiefly distinguished . . . by the position of the bases of the ventrals under the lower angles of those of the pectorals. The color is tawny, much darker in the centres of the scales on the back and on the sides above the pectorals. The posterior border of the orbit is margined by a black crescent. The dorsal has a few minute black dots. The membranous margin of the preopercle presents the appearance of being sustained by rays."

A single specimen about 4 inches long was collected at Shimoda in Izu, by Dr. J. Morrow, of the expedition of Commodore Perry. It was not seen by us. In *C. cyclophthalma*, said to have the same form, the head is 5 in total length with caudal, the depth 4¼; eye a little less than snout, equal to interorbital width. Bleeker regards *Cichlops japonica* as an undoubted synonym of *Cichlops cyclophthalma*, and we see no reason to doubt the correctness of this view.

(κύκλος, round; ὀφθαλμός, eye.)

Family IX. OPISTHOGNATHIDÆ.

THE JAW-FISHES.

Body oblong or elongate, low, moderately compressed, covered with small cycloid scales; lateral line present, straight, running close to the dorsal fin, not extending much behind middle of body. Head large, naked, the anterior profile decurved, no ridges, spines, or crests above. Mouth terminal horizontal, its cleft usually very wide, the maxillary sometimes greatly dilated; supplemental maxillary present; premaxillaries protractile; jaws subequal, with conical or cardiform teeth; vomer usually with a few teeth; palatines toothless; opercles unarmed; no suborbital stay. Pseudobranchiæ present. Gill rakers rather long; gills 4, a slit behind the fourth; gill membranes somewhat united, free

from the isthmus. Branchiostegals 6. Air bladder present. No pyloric cæca. Vertebræ large, about 27 in number. Dorsal fin long, continuous, its anterior half composed of slender, flexible spines, which pass gradually into soft rays; caudal distinct, rounded or lanceolate; tail not isocercal, the last vertebra expanded (27 to 34); anal long and low, without distinct spines; ventrals separate, thoracic I, 5, the middle rays longest; pectorals fan shaped. Small fishes inhabiting rocky bottoms in tropical seas, many of them with bright markings. The species are almost everywhere all rarities, living about rocks in deep or shallow water; nowhere abundant. This group is very closely related to the Pseudochromididæ with which Dr. Boulenger unites it, apparently with justice.

a. Maxillary not of inordinate length, truncate behind, much shorter than head; caudal moderate, rounded behind; body oblong, moderately compressed.
b. Dorsal spines all simple ..... *Gnathypops*, 15.
bb. Dorsal fin with the anterior spines transversely forked or Y-shaped; maxillary about half length of head ..... *Stalix*, 16.

15. GNATHYPOPS Gill.

Gnathypops Gill, Proc. Ac. Nat. Sci. Phila., 1860, p. 241 (*maxillosus*).

This genus differs from *Opisthognathus* in having the maxillary of medium length and truncate behind, not extending to edge of opercle; caudal moderate, rounded behind. Dorsal spines all simple and normal. Species in form and habit agreeing closely with those of *Opisthognathus*.

(γνάθος, jaw; ὕπο, below; ὤψ, eye.)

a. Dorsal, anal and caudal plain, without dark bands; dorsal rays X 14; anal II, 12; scales 60 ..... *hopkinsi*, 24.
aa. Dorsal, anal, and caudal with dark bands; opercle without black blotch; caudal bordered with black; ventrals dark. D. X, 11; A. II, 10; scales 48. *evermanni*, 25.

24. GNATHYPOPS HOPKINSI Jordan and Snyder, new species.

Head 3¼ in length, depth 4⅔; depth of caudal peduncle 2⅔ in head; eye 3½; snout 6; interorbital space 11; D. X, 14; A. II, 12; scales in lateral series 60.

Body compressed, the caudal peduncle deep, dorsal outline of body not much elevated. Head large, broader than body, the anterior profile steep, rounded; snout short, blunt, the jaws equal. Eye large, the diameter greater than length of snout, placed high in head and anteriorly; directed obliquely upward and forward; interorbital space about as wide as pupil, convex. Mouth very large, the maxillary extending far beyond eye, its length 1½ in head, the upper edge with a small supplemental bone, the posterior end of which projects beyond edge of maxillary. Teeth in narrow bands on anterior part of jaws,

in single rows posteriorly, the outer and the posterior ones enlarged, those on the posterior part of the lower jaw fang-like, curved backward; no teeth on the vomer, palatines, or tongue; pharyngeal teeth villiform. Pseudobranchiæ small, in a small pocket at upper end of gill arches; gill rakers on first arch 15 + 26, very long and slender.

Head naked, the bones without spines, no cirri; body covered with very thin cycloid scales, the nape, a narrow area along base of dorsal fin, and the breast naked. Lateral line incomplete, extending along base of spinous dorsal, traces of it extending farther back.

Dorsal fins continuous, gradually increasing in height posteriorly, the tenth or eleventh ray highest, contained about $1\frac{5}{6}$ times in head. Anal inserted below the second dorsal ray, the seventh or eighth ray highest, contained about 2 times in head, both anal and dorsal reach-

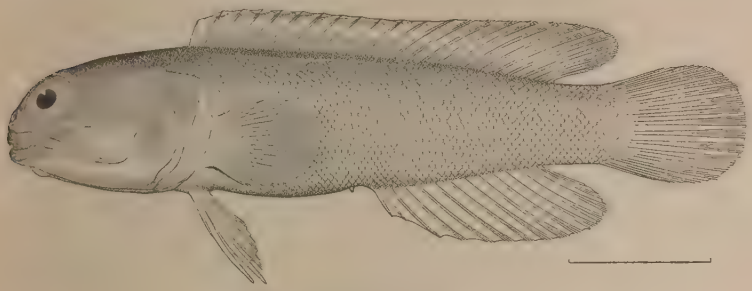

FIG. 5.—GNATHYPOPS HOPKINSI.

ing when depressed considerably beyond base of caudal fin. Caudal rounded, its length $1\frac{2}{3}$ in head. Pectorals rounded, 2 in head. Ventrals $1\frac{3}{4}$ in head, 2 of the rays simple, projecting beyond membrane of fin.

Color in alcohol light olive, brownish on upper part of head and cheeks and along back, the dark color extending on base of dorsal; a broad, light, longitudinal band on dorsal, the fin bordered with dusky, narrowly tipped with white; caudal and pectorals dusky, anal and ventrals white.

The species is represented by a single individual about 80 millimeters long, collected at Misaki and presented by Professor Mitsukuri, of the Imperial University. It is numbered type 6541, Leland Stanford Junior University Museum.

(Named for Timothy Hopkins, of Menlo Park, California, in recognition of his invaluable aid in our explorations of Japan.)

25. GNATHYPOPS EVERMANNI Jordan and Snyder, new species.

Head $2\frac{1}{4}$ in length, depth $3\frac{3}{5}$; depth of caudal peduncle 3 in head; eye 3; interorbital space 12; snout $7\frac{1}{2}$; D. X, 11; A. II, 10; P. 19; scales in lateral series 48; in transverse series 18.

Body deep, compressed, the caudal peduncle especially so; dorsal contour rounded, the ventral line nearly straight. Head large, its width greater than that of body. Eyes very large, in anterior part of head, directed obliquely upward and forward; interorbital space narrow, concave. Mouth exceedingly large, the maxillary extending beyond eye a distance about equal to half its length, contained 1½ times in head, the posterior edge broad, truncate, not slipping beneath preorbital; a supplemental bone on upper posterior edge. Teeth long, slender in a single row in each jaw; upper jaw with 4 small, curved fangs at tip just behind the other teeth; vomer and palatines without teeth, pharyngeals with villiform teeth. Pseudobranchiæ present; gill rakers very long and slender, 11 + 18 on first arch.

Head naked, without tentacles or spines; body with small cycloid scales, a narrow area on breast naked. Lateral line incomplete, passing along upper part of body to near insertion of soft dorsal where it ends.

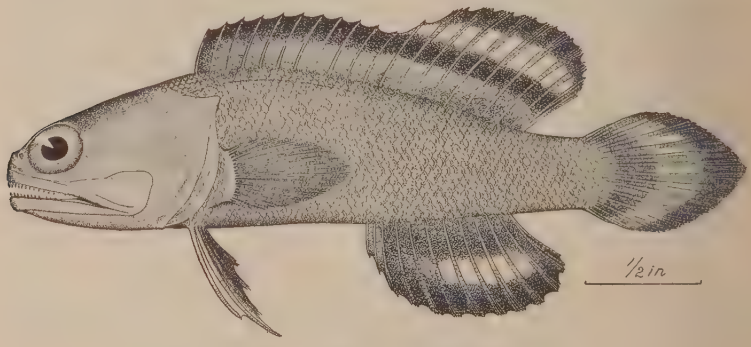

FIG. 6.—GNATHYPOPS EVERMANNI.

Dorsal fins united, the spinous dorsal inserted above upper edge of gill opening, the posterior rays slightly higher than the anterior ones, contained 3 times in head; the rays higher than the spines, the longest contained about 1¾ in head; when depressed, the tips of the posterior rays just touch the base of caudal. Anal inserted slightly in advance of beginning of soft dorsal, the fin not reaching as far posteriorly as does the latter. Caudal acutely rounded, contained 4 times in length. Pectoral pointed, 5 in length. Second ray of ventral longest, 4½ in length.

Color brownish, each scale edged with darker. A broad blackish band along upper part of spinous dorsal, continued along near middle of soft dorsal, above this a light band on soft dorsal bordered by a dark marginal band. Caudal with a narrow, lunate, vertical light band at base, then a broad dark band followed by a light one, and finally a terminal dark border. Anal very dark, becoming black along the border, an elongate, white area near the center. Ventral dark, the membrane between the outer rays white. Pectorals dusky.

Two specimens, one, the type, No. 6542, Leland Stanford Junior University Museum, the other in U. S. National Museum, were obtained from the fishermen's boats at Wakanoura, Kii. They measure about 80 millimeters in length.

(Named for Dr. Barton Warren Evermann, ichthylogist of the U. S. Fish Commission.)

16. STALIX Jordan and Snyder, new genus.

Stalix JORDAN and SNYDER, new genus (*histrio*).

This genus is allied to *Gnathypops*, from which it is mainly distinguished by the form of the anterior spines of the dorsal fin, which are Y-shaped, transversely forked, as described below. The head is short and blunt, and the maxillary relatively very short, about half length of head. The single known species is Japanese.

(στάλιξ, a forked stick.)

26. STALIX HISTRIO Jordan and Snyder, new species.

Head $3\frac{2}{3}$ in length; depth 4; depth of caudal peduncle $2\frac{1}{3}$ in head; eye $3\frac{1}{4}$; snout 7; interorbital space 11; D. XI, 9; A. II, 11; scales in lateral series 48; in transverse series 19.

Body rather elongate, compressed, the dorsal contour not elevated; head a little broader and about as deep as body. Eye very large, placed in anterior part of head, directed obliquely forward, the upper rim

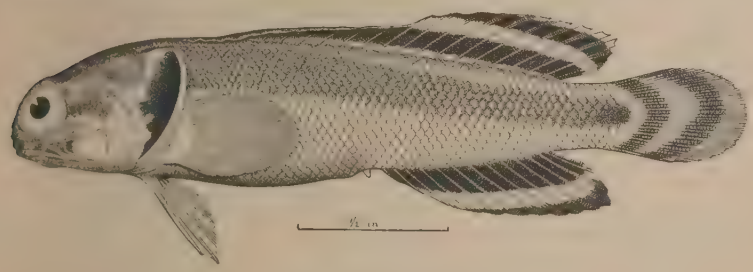

FIG. 7.—STALIX HISTRIO.

projecting above contour of head; interorbital space narrow, concave. Snout blunt, rounded, jaws subequal, the lower slightly shorter than the upper. Mouth horizontal, the maxillary extending far beyond orbit, its length about $1\frac{1}{3}$ in head, truncate posteriorly, a small supplemental bone on the upper edge. Teeth on the jaws in narrow bands anteriorly, the bands narrowing and becoming a single row posteriorly; no teeth on vomer or palatians. Gill-rakers on first arch 8 + 10, very long and slender; pseudobranchiæ present.

Body with medium-sized, thin, cycloid, loosely attached scales; a small naked area on nape and on breast and belly, the head naked,

and without spines or cirri. Lateral line incomplete, extending along back near base of spinous dorsal.

Dorsal fins continuous, the spinous dorsal of peculiar structure. the five anterior spines forked or Y shaped, the arms of the Y extending transversely, the fleshy fin membrane having a lateral fold on either side and a convexity along the dorsal surface, conforming to the shape of the spines, the posterior spines shaped as usual; soft rays higher than the spines, the longest contained about 1¾ times in head. Caudal rounded posteriorly. Anal inserted below beginning of soft dorsal, the rays about equal in length to those of the dorsal; when depressed both dorsal and anal reach the base of caudal. Pectorals rounded, about 1¾ in head. Ventrals pointed, about as long as the pectorals.

Upper sides with a broad, dusky band extending from gill-opening to middle of base of caudal where it is darkest; head dark on the upper and anterior surface, the opercle with a broad blackish patch extending nearly over its surface; a dark longitudinal band covering the greater part of spinous dorsal and extending along basal half of soft dorsal, a narrow light band along base of both fins, a second dark band on the soft dorsal, separated from the first by a light space of about equal width, the fin with a light margin posteriorly. Caudal with two lunate, dusky bands, the fin with a broad light margin. Pectorals and ventrals immaculate.

The species is represented by a specimen 62 millimeters long from Nagasaki. Type No. 6543, Leland Stanford Junior University Museum.

(*Histrio=harlequin.*)

SUMMARY.

Group TRACHINOIDEA.

Family I. NOTOTHENIIDÆ.

1. *Parapercis* Bleeker.

1. *pulchella* (Schlegel); Wakanoura, Nagasaki.
2. *ommatura* Jordan and Snyder; Kobe, Tsuruga, Tokyo, Wakanoura, Nagasaki.
3. *hexophthalma* (Ehrenberg).

2. *Neopercis* Steindachner.

4. *sexfasciata* (Schlegel); Tokyo, Awa, Hiroshima, Misaki, Onomichi, Kobe, Wakanoura, Tsuruga, Nagasaki, Suruga Bay, Sagami Bay, Owari Bay.
5. *multifasciata* (Döderlein); Tokyo, Owari Bay, Suruga Bay, Sagami Bay.
6. *aurantiaca* (Döderlein).

3. *Bembrops* Steindachner.

7. *caudimacula* Steindachner.

4. *Pteropsaron*[1] Jordan and Snyder.

8. *evolans* Jordan and Snyder; Suruga Bay, Sagami Bay.
9. *verecundum* Jordan and Snyder, Suruga Bay.

[1] See footnote on page 469: *Pteropsaron* is a congener of *Parapercis* and *Neopercis*, and it is doubtful whether any of these really belong to *Nototheniidæ*.

Family III. URANOSCOPIDÆ.

5. *Uranoscopus* Linnæus.

10. *oligolepis* Bleeker.
11. *japonicus* Houttuyn; Tokyo, Wakanoura, Hakata.
12. *bicinctus* Schlegel; Wakanoura, Misaki, Tokyo.

6. *Ichthyscopus* Swainson.

13. *lebeck* (Schneider); Wakanoura, Onomichi, Hakata.

7. *Gnathagnus* Gill.

14. *elongatus* (Schlegel); Aomori.

8. *Ariscopus* Jordan and Snyder.

15. *iburius* Jordan and Snyder; Tomakomaki.

Family IV. CHAMPSODONTIDÆ.

9. *Champsodon* Günther.

16. *vorax* Günther; Wakanoura, off Enoura.

Family V. TRICHODONTIDÆ.

10. *Trichodon* (Steller).

17. *trichodon* (Tilesius).

11. *Arctoscopus* Jordan and Evermann.

18. *japonicus* (Steindachner); Kushiro, Tsugaru, Iturup Island.

Family VI. SILLAGINIDÆ.

12. *Sillago* Cuvier.

19. *sihama* (Forskål); Tokyo, Tsuruga, Onomichi.
20. *japonica* Schlegel; Hakodate, Matsushima, Tokyo, Misaki, Wakanoura, Tsuruga, Onomichi, Hiroshima, Hakata, Kawatana, Nagasaki.
21. *parvisquamis* Gill, Tokyo.

Family VII. LATILIDÆ.

13. *Latilus* Cuvier and Valenciennes.

22. *japonicus* (Houttuyn); Tokyo, Wakanoura, Nagasaki.

Group II. PERCIFORM FISHES OF DIVERSE AFFINITIES.

Family VIII. PSEUDOCHROMIDÆ.

14. *Cichlops* Müller and Troschel.

23. *cyclophthalma* Müller and Troschel.

Family IX. OPISTHOGNATHIDÆ.

15. *Gnathypops* Gill.

24. *hopkinsi* Jordan and Snyder; Okinose near Misaki.
25. *evermanni* Jordan and Snyder; Wakanoura.

16. *Stalix* Jordan and Snyder.

26. *histrio* Jordan and Snyder; Nagasaki.